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SOVIET-BLOC PARTICIPATION IN THE IQSY

Review Article

AID Work Assignment No. 35
Task 25, Report 1

Aerospace Information Division
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FOREWORD

This is the first in a series of reports in response to AID Work Assignment No. 35, Task 25. Materials used for this report are based on Soviet sources.

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INTRODUCTION

No comprehensive official exposition of the organization, personnel, and facilities of the IQSY research program of the USSR has been published in the Soviet press. However, the Soviet Geophysical Committee has released two draft statements of the program, the first in mid-1962 (designated hereafter as Ref. 1) and the other at the Rome conference in March 1963 (Ref. 2). These statements indicate that the guiding principle has been the provision of the greatest possible comparability between IQSY observations and those made during the IGY-IGC. Until the appearance of further statements, it seems useful to suggest that this continuity can probably be assumed to extend to all aspects of the Soviet IQSY program. In addition to summarizing the information now available, this report presents press and periodical materials illustrative of the Soviet program, particularly its organization, personnel, and facilities. Further issues of this series will correct and supplement this preliminary report.

Soviet Geophysical Committee: In February 1961, the Soviet IGY Committee was reorganized into an "Interdepartmental Geophysical Committee of the Presidium of the Academy of Sciences of the USSR," known also by the abbreviated title "Soviet Geophysical Committee." The committee itself is organized into a 14-man bureau plus 46 committee members. In addition, there are 13 scientific sections: Geodesy, Seismology and Physics of the Earth's Interior, Volcanology, Geochemistry, Meteorology and Physics of the Atmosphere, Oceanography, Hydrology, Glaciology, Geomagnetism and Earth Currents, Aurora and Airglow, Ionosphere, Solar Activity, and Cosmic Rays. [Appendix I a includes a list of members of IQSY sections and their affiliations].

Five special working groups consisting of representatives of the appropriate scientific sections were also organized: Working Group on the Upper Mantle, Working Group on the International Year of the Quiet Sun, Working Group on Coordination of the Processing of IGY Data, Working Group on Preparation of Guides to World Data Centers, and an Editorial Board of the Committee.

The Working Group on the International Year of the Quiet Sun: This group was originally made up of N. V. Pushkov, chairman; I. G. Pchelko, section on meteorology and physics of the atmosphere; Yu. D. Kalinin, section on geomagnetism and earth currents; V. A. Troitskaya, section on geomagnetism and earth currents (also scientific secretary of the working group); A. I. Lebedinsky, section on aurora and airglow; Ya. I. Likhter, section on ionosphere; B. L. Kashcheyev, section on ionosphere (meteors); E. R. Mustel', section on solar activity; and S. N. Vernov, section on cosmic rays. [Ref. 3]

Recent information indicates that V. A. Troitskaya and S. Z. Krichevskiy have been named as deputies to Pushkov, and N. Ben'kova has replaced Ya. I. Likhter as representative of the section on ionosphere. The addition of V. I. Krasovskiy (Institute of the Physics of the Atmosphere) and V. P. Tsesevich (Odessa State University) means that night sky and meteor research, respectively, will be further represented in the working group.

However, the expansion of the IQSY working group membership should apparently be explained as the effort to represent research units o outside the Academy of Sciences USSR. I. G. Pchelko of the Central Forecasting Institute of the Main Administration of the Hydrometeorological Service was an original member of the IQSY working group. . N.. M. Yerofeyev, a member of the section on the ionosphere, will represent the Siberian Institute of Geomagnetism, Ionosphere, and Propagation of Radio Waves at Irkutsk, which will act as the eastern subcenter for the Moscow Regional Warning Center.

Other new members of the working group and their affiliations follow: A. M. Gusev, Interdepartmental Committee for Antarctic Study; V. M. Driatskiy, Arctic and Antarctic Scientific Research Institute; T. S. Razmadze, Geophysical Committee of the Georgian Academy of Sciences; P. K. Sen'ko, Arctic and Antarctic Scientific Research Institute (Sen'ko will be concerned with Antarctica, and Driatskiy with the Arctic); V. B. Sollogub, Interdepartmental Geophysical Committee, Ukrainian Academy of Sciences; Ye. I. Tolstikov, Main Administration of the Northern Sea Routes; Ye. G. Fedorovich, Ministry of Communications; and A. Kh. Khrigan, Editorial Board of the Soviet Geophysical Committee, and editor of Geofizicheskiy byulleten'. (Ref. 4)

IQSY PROGRAM OF THE USSR

(Summary of Refs. 1 and 2)

Introductory Comment: The recommendations of the IQSY Assembly held in Paris in March 1962 and the regional IQSY conference in Budapest in October 1962 were considered in preparing the Soviet program.

To ensure the greatest possible comparability of IQSY and IGY-IGC observations, "all" (Ref. 2) or "most" (Ref. 1) of the IGY stations will participate in the IQSY. However, some stations will expand their observations, and new stations may be ready for the IQSY.

IQSY stations fall into two categories: 1) "key" or "synoptic" and 2) "supporting" or "research." Category 1 stations provide the World Data Centers with observational materials for every IQSY day; category 2 stations provide data only for individual periods at the request of the World Data Centers.

Stations are identified by the name of the nearest city, so that it is possible for the coordinates for the same city to vary on different station lists.

World Days and Special World Intervals: The Regional Warning Center functions of announcing the World Days and Special World Intervals will be performed by the Institute of Geomagnetism, Ionosphere, and Propagation of Radio Waves of the Academy of Sciences USSR. Two subcenters will be coordinated with the Regional Center, a western one in Prague under the Geophysics Institute of the Czech Academy of Sciences, and an eastern center in Irkutsk within the Siberian Institute of Geomagnetism, Ionosphere and Propagation of Radio Waves, Siberian Department, Academy of Sciences USSR.

The Ministry of Communications in Moscow and the Central Radio Communications Office of the Main Administration of the Northern Sea Routes (Arctic and Antarctic stations) will assist in transmitting warnings about alerts and special intervals to the USSR Academy of Sciences through the center "Cosmos." Warning messages concerning satellite launchings will be issued by the Astronomical Council of the Academy of Sciences USSR at the "Cosmos" center.

Solar Activity

Observations on Sunspots (Station List 2): Observations of sunspots will include determinations of sunspot coordinates, their areas, and number. Three more observatories (Irkutsk, Ussuriysk, and Tashkent) will start measurements of the magnetic fields of sunspots.

Chromospheric Observations. Optic Patrol of Solar Flares (Station List 3): Twelve solar observatories will participate in chromospheric observations. The coordinates, brightness, and character of flocculae in the $H\alpha$ and Ca lines will be determined. In the optic patrol of solar flares, the 11 observatories that will take part are equipped with photosphere - chromosphere telescopes using interference - polarizing filters. Observation time will be arranged so as to provide continuous observations. Chromospheric flare observations include determinations of the time of the beginning and end of the flare and its coordinates and intensity. Two observatories will undertake observations of the solar corona in an effort to determine the coordinates, types, heights, areas, and other characteristics.

Observations of the Solar Corona (Station List 4): Observations of the solar corona will be conducted by two high-mountain observatories (Kislovodsk and Alma-Ata) and probably at sea level (at Pulkovo and Krasnaya Pakhra [Ref. 1]; or Pulkovo, Moscow, and Irkutsk [Ref. 2]).

Radioemission of the Sun (Station List 5): Changes in radioemission of the sun will be registered at various frequencies, the position of the sources on the solar disk determined, and the spectral characteristics of solar radiosplashes studied. Displays of solar activity in the radio wave bands will be compared with phenomena observed by optical methods in the various layers of the sun. Observations of radio source overlappings by the solar corona will be conducted with a view to studying the corona at great distances from the sun.

Observation of Comets (Station List 6): Comets will be studied as direct indicators of the ultraviolet and corpuscular emission of the sun, for sounding conditions in interplanetary space at various distances from the sun, and for study of the structure and special features of corpuscular flows at all heliophysical latitudes (not only in the ecliptic). The program includes the photography of bright comets and photoelectric spectral, and polarimetric observations.

Geomagnetism and Earth Currents

Temporary Variations of the Magnetic Field (Station List 7): The program calls for study of solar-quiet and magnetic micropulsations and elementary solar storms or baylike disturbances and their correlations with other geophysical events. All magnetic observatories and stations are equipped with registers with an average speed of 20 cm/hr; 6 observatories will have LaCour recorders (rate 240 mm/hr). The production of new variometers with stable base values and zero temperature coefficients is announced. (See Appendix III). Cooperation with Norwegian, Finnish, and Swedish stations in study of local variations in the Fennoscandia region is suggested. Enlargement of the network of stations observing rapid variations of the geomagnetic field is under consideration.

Earth Currents (Station List 8): All stations for recording earth currents have normal recording 20 mm/hr and ultrarapid recording 1800 mm/hr. Ultrarapid record copies of earth currents will not be forwarded to centers. The World Data Centers will receive copies of normal registration for each day from all key stations. Rapid-run registrations will be collected only for Special Intervals. The supporting stations will fill in the gaps in the data of neighboring key stations. Monthly tables of mean hourly values of earth-current components will not be forwarded to the World Data Centers. Cooperation in the study of local magnetic variations in Fennoscandia and coordination of parameters and exchange of data with earth-current stations at magnetically conjugate points to the Soviet stations are suggested. Cooperation in international study of magnetotelluric deep sounding is also proposed.

World Magnetic Survey: The nonmagnetic ship Zarya will conduct repeated measurements in the Atlantic. Special cruises will be organized to study secular variations of the magnetic field. Oceanographic ships will conduct measurements by towed magnetometers. (Magnetic data obtained by satellites will also be submitted to the World Magnetic Survey).

Ionosphere

Vertical Soundings (Station List 9): [It is not clear from the references whether two drifting ice flow stations and two ship stations (Ref. 1) or only one station in each category (Ref. 2) will participate]. Key stations will forward observational material to World Data Centers daily; supporting stations only during Special World Intervals. Ionospheric soundings will be made at 15- or 30-minute intervals. The World Data Centers will receive hourly tables and calculations of true ionospheric heights obtained by the processing of atmospheric data.

Absorption (Station List 10): Method A1 (impulses with vertical emission) and method A2 (extraterrestrial noises) will be used for absorption measurements. By the beginning of the IQSY, the number of stations measuring absorption by method A1 may be enlarged. The measurement of absorption with riometers according to method A2 will be conducted on frequencies in the 2-30 Mc band.

Ionospheric Drifts (Station List 11): Ionospheric drift (wind) measurements will be carried out on the basis of impulse fading observations (method D1) and radar observations of meteor trail drifts (method D2). Drift observations will be carried out at the same stations as during the IGY. Drift measurements in Moscow will be conducted by method D1 at two installations: with small bases, by the Institute of Geomagnetism, Ionosphere, and Propagation of Radio Waves, and with large ones (about 30 km), by Moscow University. In addition to radar observations in four points (Odessa, Kiyev, Dushanbe, and Ashkhabad), a photographic survey of meteor trails will be carried out, the data on the latter to be used also for air flow determination. Photographic study of the height, speed, and brightness of meteors will be utilized for determination of pressure, density, and height of the homogeneous atmosphere in a meteor zone at altitudes of 60-120 km.

Atmospheric Noises (Station List 12): Atmospheric noise measurements will be made at the same stations as during the IGY-IGC. Measurement methods and equipment (statistic analyses) will also be the same. Most of the stations are under the Technical Control Center, Ministry of Communications USSR. Atmospheric noise levels will be compared with data on thunderstorm activity.

Atmospheric Whistles and Low-Frequency Emission (Station List 13): In addition to Moscow and Mirnyy, stations in Murmansk and Irkutsk will be placed in operation.

Airglow

Airglow (Station List 14): Synoptic photoelectric and spectrographic observations of the main emissions of the night sky (6300, OH, 5893, and 5577 Å) will be carried out at two stations (Abastumani and Ashkhabad). Observations of the hydroxyl emission for the determination of the intensity and rotation temperature will be conducted at five stations (Zvenigorod, Abastumani, Ashkhabad, Alma-Ata, and Yakutsk). The twilight emission of helium will be observed at the Zvenigorod station, and the twilight emission of sodium at the Abastumani station. The aurora spectra will be registered with spectrographs of high dispersion at stations in high latitudes. Spectrographic installations consisting of three diffraction spectrographs with dispersions from 80 to 150 Å per mm and effective apertures of f-0.8 and f-1.5 for the visible and infrared parts of the spectrum, respectively, will be used.

Aurora

Because of the lower auroral activity of the IQSY, emphasis will be given to visual observation and photographic stations located at geomagnetic latitudes greater than 60°. Methods and stations will be the same as during the IGY-IGC. A main area of research will be the determination of variations in geographical distribution of aurora in the transition from the maximum to the minimum of solar activity. Attention will be devoted to the comparison of aurora borealis with other geophysical phenomena in high latitudes, and also with changes in the radiation zones of the earth.

Photographic Observations (Station List 15): To permit comparison, the cameras will be installed where possible at IGY sites. Key auroral photography stations will send ascafilms to the World Data Centers daily; the supporting stations at Special World Intervals only. Photographs will be made with C-180 cameras on 35-mm film. According to Ref. 1 stations at geomagnetic latitudes greater than 60° will take photographs not less than once a minute, and if possible, twice a minute with two different exposures. According to Ref. 2, the stations will take one picture every five minutes and more often during special interval observations. Ascaplots will be sent daily to the World Data Centers.

Spectrophotometric and Spectral Observations (Station List 15): The same type of patrol spectrographs as used previously will be installed at a number of stations. (The visible spectral range of these instruments ranges from 3960 to 6500 Å). Particular study will be given to hydrogen emissions in the aurora spectra. At Murmansk, Tiksi Bay, and Mirnyy in Antarctica, spectral, spectrophotometric, and photometric observations will be performed as separate research with nonstandard equipment.

Radar (Station List 15): The program calls for radar observations of the aurora at Murmansk, Dikson Island, Tiksi Bay, and Mirnyy.

Visual Observations of Aurora. Visual observations of aurora will be conducted by meteorological stations under the Main Administration of the Hydrometeorological Service and the Main Administration of the Northern Sea Routes. As a rule, synoptic stations will carry out hourly observations when possible. The total number of such stations will be about 200. Observations will be conducted in accordance with the new classification of aurora borealis worked out by the International Association of Geomagnetism and Aeronomy.

Cosmic Rays

Cosmic Rays (Station List 16): Low-solar activity will make possible the study of low-energy cosmic rays, the nature of 24-hour variations, the presence and structure of magnetic fields in plasma clouds, and the character of the relations with the geomagnetic field. Continuous registration will be undertaken at 12 stations. Variations of the neutron component will be registered at 10 stations with neutron monitors, and variations of the meson component with ionization chambers and cubic telescopes at 11 stations. Registration of the neutron component of cosmic rays is also planned at the Vostok station in Antarctica. The study of cosmic ray variations of high energy will be conducted with underground installations at three stations. It is planned to continue research of the latitude effect in nucleon and meson components with the Zarya and other boats. Observations of cosmic rays in the stratosphere with sounding balloons will be carried out at these stations: Murmansk, Tiksi, Moscow, Alma-Ata, and Mirnyy.

Meteorology

The program includes visual and instrumental observations of noctilucent clouds, radio sounding and radio wind observations to altitudes of 20-30 km, observations of solar radiation and ozone, and radiogoniometric observations of atmospherics. Nonsystematic observation of the chemical composition of precipitations will be conducted. Launchings of meteorological rockets will be undertaken for study of changes of pressure, density, and concentration of atmospheric components.

The IQSY meteorology program differs from the IGY-IGC program in that it does not include surface meteorological observations. The network of meteorologic stations participating in the IQSY therefore will be smaller. Aerological observations will be undertaken at 55 stations (Station List 17). Daily launchings of radio soundings to maximum heights will be carried out twice, at 00.00 hrs and 12.00 hrs U. T. Actinometric measurements will be conducted at 33 stations; ozone measurements at 5 stations. At some aerological stations radiation and ozone measurements will be made by means of sounding balloons. More than 100 meteorological stations will participate in visual observations of luminous clouds. At some points instrumental observations of luminous clouds will be organized. Atmospheric electrical observations will be conducted at 22 stations, (Station Lists 20-21). It is planned to collect information on thunder activity during the IQSY from a larger network of meteorological stations (about 200). The stations will indicate at what hours thunderstorms with lightning discharges were registered.

Aeronomy and Cosmic Researches

The study of phenomena in the upper layers of the atmosphere, in the layers near the surface of the earth, and in interplanetary space, will be repeated to determine the relationships of these phenomena with solar activity. The program will include further studies of pressure, temperature, density, neutral and electrically charged components, movements in the ionosphere, measurements of ultraviolet, X-ray, and corpuscular emissions of the sun, studies of the magnetic field, and radiowave propagation through the ionosphere. The satellite and rocket measurements will be supported by surface observations at solar, magnetic-ionospheric, and other stations. [The Soviet program of cosmic and aeronomic research with satellites and rockets will be announced at the June 1963 meeting of COSPAR].

World Centers of Collection and Distribution
Data and Analytical Centers

The IGY-IGC WDC's for geomagnetism, earth currents, aurora, airglow, ionosphere, solar activity, cosmic rays, satellites and rockets, and meteorology will collect and distribute the IQSY data in the same manner as during the IGY-IGC.

1) The World Data Center B_2 (WDC B_2-Molodezhnaya 3, Moscow, USSR) will collect and distribute data on:

1. Solar activity;
2. Geomagnetism and earth currents;
3. Ionosphere;
4. Night air glow;
5. Aurora;
6. Cosmic rays.

2) The World Data Center B_1 (WDC B_1-Molodezhnaya 3, Moscow B-296, USSR) will collect and distribute data on meteorology and the results of observations and research with rockets and satellites.

For the convenience of scientists working in Siberia and the Far East, copies of materials from Center B will be sent to Irkutsk to the Siberian Institute of Geomagnetism, Ionosphere, and Propagation of Radio Waves.

The Soviet Geophysical Committee has assumed responsibility for the organization of work in the World Analytical Centers of the following:

Solar activity

1) Magnetic fields of the sun. Crimean Astrophysical Observatory.
2) Photometric index of flares. Crimean Astrophysical Observatory.

Geomagnetism

3) Earth current variations during 24 hrs. Institute of Physics of the Earth.

Ionosphere

4) Ionosphere drifts. Institute of Geomagnetism, Ionosphere, and Propagation of Radio Waves.
5) Aurora Spectral Patrol Researches.

Cosmic Rays

6) Underground registration.

Meteorology

7) Actinometric observations. Main Geophysical Observatory.
8) Observations of luminous clouds. Institute of Physics and Astronomy, Estonian Academy of Sciences.
9) Atmospheric electricity. Main Geophysical Observatory.

REFERENCES

1. Soviet geophysical committee. Draft statement on IQSY research program. [Original in custody of IQSY World Center in Washington, D.C. Also, has been reprinted with some very slight emendations, in IG bulletin, no. 62, Aug 1962, 14-19.]

2. Soviet geophysical committee. Draft statement on IQSY research program. [Original in custody of IQSY World Center in Washington, D.C. Originally presented at the Rome conference in March 1963, this reference will appear in IG bulletin in the near future.]

3. Geofizicheskiy byulleten', no. 10, 1961, 9-17, no. 11, 75-76, 1962.

4. Geofizicheskiy byulleten', no. 12, 1962, 131.

Appendix I-a

[from Reference 3 (see p. 10)]

SOVIET GEOPHYSICAL COMMITTEE

Section of Geomagnetism and Earth Currents

Bureau:

Yu. D. Kalinin, chairman, Institute of Geomagnetism, Ionosphere, and Propagation of Radio Waves
V. A. Troitskaya, vice-chairman, Institute of Physics of the Earth
A. G. Kalashnikov, Institute of Physics of the Earth
V. M. Mishin, Siberian Branch, Institute of Geomagnetism, Ionosphere, and Propagation of Radio Waves
A. P. Nikol'skiy, Arctic and Antarctic Scientific Research Institute
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Members:

V. I. Afanasiyeva, Institute of Geomagnetism, Ionosphere, and Propagation of Radio Waves
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A. M. Kitaytsev, Main Administration of the Hydrometeorological Service
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Ya. L. Alpert, Institute of Geomagnetism, Ionosphere, and Propagation of Radio Waves

V. M. Driatskiy (in his absence, G. N. Gorbushina), Arctic and Antarctic Scientific Research Institute

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V. A. Krat, Main Astronomical Observatory
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A. B. Severnyy, Crimean Astrophysical Observatory
Yu. M. Slonim, Tashkent Astrophysical Observatory
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Section on Cosmic Rays

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Appendix I-b

[From Reference 2 (see p. 10)]

Table 2*

List of the IQSY Stations of the USSR for Sunspot Observations

No.	Index	Station	Lat. N	Long. E	Spots	Magnetic field of spots
1	B004	Pulkovo	59.8	30.3		+
2	B035	Moscow	55.5	37.3		+
3	C002	Irkutsk	52.3	104.3	+	
4	B125	Kiyev	50.1	30.1	+	
5	B145	L'vov	49.1	24.0	+	
6	C030	Simferopol'	44.1	34.0		+
7	C037	Ussuriysk	43.1	132.0	+	
8	C043	Kislovodsk	43.1	42.1	+	+
9	C071	Abastumani	41.1	42.1	+	
10	C076	Tashkent	41.0	69.0	+	
11	C091	Baku	40.1	48.1	+	+

*Tabular designations in the original were retained. Table 1 of original source was not used.

Table 3

List of the IQSY Stations for Chromospheric Observations in the USSR

No.	Index	Station	Lat.	Long.	Plage indices	Flare patrol	Rapid processes	Chromosphere (spectroheliograms)
1	B035	Moscow	55.5	37.3	+	+	+	
2	C002	Irkutsk	52.3	104.3		+	+	
3	B125	Kiyev	50.1	30.1		+	+	
4	B145	L'vov	49.1	24.0		+		
5	B141	Khar'kov			+	+		
6	C026	Simferopol'	44.1	34.0		+		+
7	C037	Ussuriysk	43.1	132.0		+	+	
8	C043	Kislovodsk	43.1	42.1	+			+
9	C050	Alma-Ata	43.0	76-1		+		
10	C071	Abastumani	41.1	42.1	+	+	+	
11	C076	Tashkent	41.0	69.0	+	+	+	
12	C091	Baku	40.1	48.1		+		

Table 4

List of the IQSY Solar Corona Stations
of the USSR

No.	Index	Station	Lat. N	Long. E	Corona-lines	K-corona
1	C043	Kislovodsk	43.1	42.1	+	+
2	C050	Alma-Ata	43.0	76.1	+	

Table 5

List of the IQSY Stations of the USSR for Solar Radio Emission Observations

No.	Index	Station	Lat. N	Long. E	Intensity	Polarization	Localization of sources	Spectrum	Radio frequencies
1	B004	Pulkovo	59.8	30.3			+		9375
2	B017	Riga	57.0	24.1	+		+		220
3	B025	Gor'kiy	56.1	44.3	+	+		+	206, 3000, 9375, 19000
4	B035	Moscow	55.5	37.3	+	+		+	208
5	C002	Irkutsk	52.3	104.3	+				208, 9000
6	C026	Simferopol'	44.1	34.0	+			+	208, 3000
7		Ussuriysk	43.1	132.0	+				208
8		Kislovodsk	43.1	42.1	+	+			178, 6000, 15000
9	C071	Abastumani	41.1	42.1	+				209, 10000

Table 6

List of the IQSY Comet Stations
of the USSR

No.	Index	Station	Lat. N	Long. E	Photo-graph	Photo-metric	Spectral
1		Simferopol'	44.8	34.1	+	+	+
2	B125	Kiyev	50.1	30.1	+	+	
3	C071	Abastumani	41.1	42.1			+
4	C084	Byurakan	40.3	44.3	+		+

Table 7

List of the IQSY Magnetic Stations
of the USSR

No.	Index	Station	Lat. N	Long. E	Normal	Rapid
1	A001	Arctica (drift.)				
2	A008	Heiss Is.	80.6	58.0		
3	A020	Chelyuskin	77.7	104.3	+	
4	A033	Dikson Is.	73.6	80.6	+	
5	A037	Tiksi Bay	71.6	129.0	+	
6	A050	Murmansk	69.0	33.0	+	
7	A077	Cape Wellen	66.2	169.8	+	
8	A121	Srednikan	62.4	152.3	+	
9	A124	Yakutsk	62.0	129.7	+	+
10	B259	Leningrad*	60.0	30.7	+	
11	B014	Borok	58.0	38.3		+
12	B019	Sverdlovsk*	56.7	61.1	+	
13	B022	Tomsk*	56.5	84.9	+	
14		Minsk	55.9	27.5	+	
15	B028	Kazan'	55.8	48.8	+	
16	B035	Moscow*	55.5	37.3	+	
17	C362	Irkutsk	52.5	104.0	+	
18	B125	Kiyev	50.7	30.3	+	+
19	B145	L'vov	49.9	23.7	+	
20	C016	Yuzhno-Sakhalinsk*	46.9	142.7	+	
21	C018	Odessa	46.8	30.9	+	+
22	C051	Vladivostok	43.8	132.3	+	
23	C364	Tbilisi	42.1	44.7	+	+
24	C076	Tashkent	41.4	69.2	+	
25	C128	Ashkhabad	38.0	58.1	+	
26	A978	Mirnyy	66.6S	93.0	+	+
27		Novolazarevskaya	71.4S	12.0	+	
28	A996	Vostok	78.4S	106.9	+	

* Stations which transmit magnetograms only for special periods.

Table 8

List of IQSY Earth Currents Stations
of the USSR

No.	Index	Station	Lat. N	Long. E
1	A009	Heiss Is.	80.6	58.0
2	A037	Tiksi Bay	71.6	129.0
3	A057	Lovozero	69.0	35.1
4	B014	Borok	58.0	38.3
5		Minsk	54.1	26.5
6	C001	Petropavlovsk	53.1	158.6
7	C362	Irkutsk	53.1	115.6
8	C016	Yuzhno-Sakhalinsk	50.8	142.2
9	B145	L'vov	48.5	22.4
10	C360	Alushta	44.7	34.4
11	C050	Alma-Ata	43.3	77.4
12	C364	Tbilisi	42.1	44.7
13	C126	Ashkhabad	38.0	58.1
14	A978	Mirnyy	66.6S	93.0
15		Novolazarevskaya	71.5S	12.0

Table 9

List of the IQSY Ionospheric Vertical Sounding Stations of the USSR

No.	Index	Station	Lat. N	Long. E
1	A001	Arctica (drift.)		
2	A008	Heiss Is.	80.6	58.0
3	A033	Dikson Is.	73.5	80.6
4	A037	Tiksi Bay	71.6	129.0
5	050	Murmansk	69.0	33.0
6	A072	Salekhard	66.5	66.5
7	A098	Providence Bay	64.4	186.6
8	A124	Yakutsk	62.0	129.7
9	B259	Leningrad*	60.0	30.7
10	B019	Sverdlovsk	56.7	61.7
11	B022	Tomsk	56.5	84.9
12	B035	Moscow	55.5	37.3
13	C002	Irkutsk	52.5	104.0
14	C010	Khabarovsk	48.5	135.1
15	C013	Rostov-on-Don	47.5	41.5
16	C016	Yuzhno-Sakhalinsk	47.0	143.0
17	C050	Alma-Ata	43.2	76.9
18	C072	Tbilisi	41.7	44.8
19	C126	Ashkhabad	38.0	58.1
20	A978	Mirnyy	66.6S	93.0
21	A996	Vostok	76.4S	106.5

* Special station transmitting data only for special periods.

Table 10

List of the IQSY Absorption Stations
of the USSR

No.	Index	Station	Lat. N	Long. E	A1	A2
1	A008	Heiss Is.	80.3	52.8		+
2	A033	Dikson	73.5	80.4	+	
3	A037	Tiksi Bay	71.6	129.9		+
4	A050	Murmansk	69.0	33.0	+	+
5	A072	Salekhard	66.5	66.5		+
6	B022	Tomsk	56.5	84.9	+	
7	B035	Moscow	55.5	37.3	+	+
8	C002	Irkutsk	52.5	104.0	+	
9	C013	Rostov-on-Don	47.5	41.5	+	
10	C050	Alma-Ata	43.2	76.9	+	
11	A978	Mirnyy	66.6S	93.0	+	+
12	A996	Vostok	78.4S	106.5		+

Table 11

List of the IQSY Ionospheric Drift Measuring Stations of the USSR

No.	Index	Station	Lat. N	Long. E	D1	D2
1	A050	Murmansk	69.0	33.0	+	
2	B022	Tomsk	56.5	84.0	+	
3	B035	Moscow	55.5	37.3	+	+
4	C002	Irkutsk	52.5	104.0	+	
5	B028	Kazan'	55.8	48.8		+
6	B142	Khar'kov	50.0	36.2		+
7	C013	Rostov-on-Don	47.5	41.5	+	
8	C115	Dushanbe	38.6	68.8		+
9	C126	Ashkhabad	38.0	58.1	+	

Table 12

List of the IQSY Atmospheric Noise Stations
of the USSR

No.	Index	Station	Lat. N	Long. E
1		Murmansk	69.0	33.0
2		Sverdlovsk	56.7	61.1
3		Moscow	55.5	37.3
4		Irkutsk	52.5	104.0
5		Kiyev	50.5	30.5
6		Khabarovsk	48.5	135.1
7		Alma-Ata	43.2	76.9
8		Tbilisi	41.7	44.8

Table 13

List of the IQSY Whistler and VLF and ELF
Stations of the USSR

No.	Index	Station	Lat. N	Long. E
1	B035	Moscow	55.5	37.3
2	A978	Mirnyy	66.6S	93.0

Table 14

List of the IQSY Airglow Stations
in the USSR

No.	Index	Station	Lat. N	Long. E	Spectro-graphic	Electro-photo-meter
1	A055	Loparskaya*	69.0	33.0	+	+
2	A124	Yakutsk*	62.0	129.7	+	+
3	B032	Zvenigorod*	55.7	35.8	+	+
4	C650	Alma-Ata*	43.3	77.4	+	
5	C071	Abastumani	37.9	38.4	+	+
6	C126	Ashkhabad	37.9	58.4	+	+

* Special station transmitting data only for special periods.

Table 15

List of the IQSY Aurora Stations
of the USSR

No.	Index	Station	Lat. N	Long. E	C-180	P.S.	RA
1	A001	Arctic (drift.)			+		
2	A008	Heiss Is.	80.6	58.0	+	+	
3	A020	Chelyuskin	77.7	104.3	+		
4	A023	Zhelaniya	76.9	68.6	+		
5	A033	Dikson Is.	73.6	80.6	+	+	
6	A037	Tiksi Bay	71.6	129.0	+	+	+
7	A042	Wrangel Is.	71.0	178.6	+		
8	B050	Murmansk	69.0	33.0	+	+	+
9	A052	Schmidt	68.9	179.9	+	+	+
10	A062	Nar'yan Mar	67.5	53.0	+		
11	A072	Salekhard	66.6	66.7	+		
12	A077	Cape Wellen	66.2	169.8	+		
13	A095	Arkhangel'sk	64.6	40.5	+		
14	A124	Yakutsk	62.0	129.7	+	+	+
15	A978	Mirnyy	66.6S	93.0	+	+	+
16		Novolazarevskaya	71.5S	12.0	+		
17	A996	Vostok	78.4S	106.9	+	+	

Table 16

List of the IQSY Cosmic Ray Stations of the USSR

No.	Index	Station	Lat. N	Long. E	I	TC	T	NM	Under-ground
1	A008	Heiss Is.	80.6	58.0			+	+	
2	A037	Tiksi Bay	71.6	129.0	+				
3		Murmansk	69.0	33.0	+	+		+	
4	A050	Cape Schmidt	68.9	179.9	+			+	
5	A124	Yakutsk	62.0	129.7	+	+	+	+	+
6	B019	Sverdlovsk	56.7	61.1	+				
7	B035	Moscow	55.5	37.3	+	+	+	+	+
8	C002	Irkutsk	52.3	104.3	+	+	+	+	
9	C050	Alma-Ata	43.0	76.1		+	+	+	
10	C364	Tbilisi	42.1	44.7	+	+	+	+	+
11	A978	Mirnyy	66.6S	93.0	+			+	
12	A996	Vostok	78.4S	106.9				+	

Table 17

List of the IQSY Upper Air Stations
of the USSR

No.	Index	Station	Lat. N	Long. E
1	20046	Heiss Is.	80.6	58.0
2	20292	Chelyuskin	77.7	104.3
3	20353	Cape Zhelaniya	77.0	68.5
4	21432	Kotel'nyy Is.	76.0	137.9
5	20674	Dikson Is.	73.5	80.2
6	20891	Khatanga	72.0	102.5
7	21965	Chetyrekhstolbovoy	70.6	162.4
8		Murmansk	69.0	33.0
9	25173	Cape Schmidt	68.9	179.5
10	23146	Cape Kamenny	68.5	73.0
11	24125	Olenek	68.5	112.5
12	23205	Nar'yan Mar	67.6	53.0
13	24266	Verkhoyansk	67.5	133.4
14	23330	Salekhard	66.5	66.5
15	23472	Turukhansk	65.8	88.0
16	25563	Anadyr'	64.8	177.5
17	22550	Arkhangel'sk	64.5	40.5
18	24507	Tura	64.2	100.0
19	25703	Seimchan	62.9	152.4
20	24959	Yakutsk	62.0	129.7
21	23804	Syktyvkar	61.7	50.9
22	23933	Khanty-Mansiysk	61.0	69.0
23	25954	Korf	60.3	166.0
24	26063	Leningrad	60.0	30.3
25	27037	Vologda	59.3	39.9
26	31088	Okhotsk	59.3	39.9
27	31004	Aldan	58.6	125.3
28	29231	Kolpachevo	58.2	82.9
29	30230	Kirensk	57.8	108.1
30	28440	Sverdlovsk	56.8	60.6
31	29574	Krasnoyarsk	56.0	92.4

Table 17 (Cont'd)

No.	Index	Stations	Lat. N	Long. E
32	27595	Kazan'	55.8	42.2
33	28698	Omsk	55.0	73.4
34	26629	Kaunas	54.9	23.9
35		Minsk	53.9	27.5
36	28952	Kustanay	53.2	63.4
37	32540	Petropavlovsk	53.0	158.8
38	30758	Chita	52.0	113.3
39	35121	Orenburg	51.8	55.0
40	34172	Saratov	51.0	46.0
41	33345	Kiyev	50.4	30.5
42	31510	Blagoveshchensk	50.2	127.5
43	34300	Khar'kov	50.0	36.3
44	35394	Karaganda	49.8	73.1
45	33393	L'vov	49.8	23.0
46	31735	Khabarovsk	48.5	135.1
47	34731	Rostov-on-Don	47.5	41.5
48	35700	Gur'yev	47.0	51.9
49	32150	Bol'shaya Yelan'	46.9	142.7
50	33837	Odessa	46.5	30.6
51	36870	Alma-Ata	43.2	76.9
52	31960	Vladivostok	43.1	131.9
53	37549	Tbilisi	41.7	45.0
54	38457	Tashkent	41.3	69.3
55	38880	Ashkhabad	38.0	58.3

Table 18

List of the IQSY Radiation Station
of the USSR

No.	Index	Station	Lat. N	Long. E
1	20292	Chelyuskin	77.7	104.3
2	20353	Cape Zhelaniya	77.7	104.3
3	21432	Kotel'nyy Is.	76.0	137.9
4	20674	Dikson Is.	73.5	80.2
5	21982	Wrangel Is.	71.0	178.5W
6	21965	Chetyrekhstolbovoy	50.6	162.4
7	24125	Olenek	68.5	112.5
8	24266	Verkhoyansk	67.5	133.4
9	23472	Turukhansk	65.8	88.0
10	22550	Arkhangel'sk	64.5	40.5
22	24688	Oimyakon	63.3	143.2
12	24959	Yakutsk	62.0	129.7
13	23955	Alexandrovskoye	60.5	77.9
14	24908	Vanavara	60.3	102.3
15	26063	Leningrad	60.0	30.3
16	31088	Okhotsk	59.3	143.2
17	28440	Sverdlovsk	56.8	60.6
18	27612	Moscow	55.8	37.6
19	28698	Omsk	55.0	73.4
20	26629	Kaunas	54.9	23.9
21	28900	Kuybyshev	53.5	50.5
22	32540	Petropavlovsk	53.0	158.8
23	30710	Irkutsk	52.3	104.3
24	30758	Chita	52.0	113.3
25	33345	Kiyev	50.4	30.5
26	36177	Semipalatinsk	50.3	80.2
27	31735	Khabarovsk	48.5	135.1
28	32150	Bol'shaya Yelan'	46.9	142.7
29	35746	Aral Sea	46.8	61.7
30	33837	Odessa	46.5	30.6
31	31960	Vladivostok	43.1	131.9
32	37549	Tbilisi	41.7	45.0
33	38457	Tashkent	41.3	69.3

Table 19

List of the IQSY Ozone Stations
of the USSR

No.	Index	Station	Lat. N	Long. E
1	20674	Dikson Is.	73.5	80.2
2	26063	Leningrad	60.0	30.3
3	33345	Kiyev	50.4	30.5
4	36870	Alma-Ata	43.2	76.9
5	31960	Vladivostok	43.1	131.9

Table 20

List of the IQSY Atmospherics Stations
of the USSR

No.	Index	Station	Lat. N	Long. E
1		Murmansk	69.0	33.0
2	26063	Leningrad	60.0	30.3
3	27612	Moscow	55.8	37.6
4		Minsk	53.9	27.5
5	32540	Petropavlovsk	53.0	158.8
6	30710	Irkutsk	52.3	104.3
7	33345	Kiyev	50.4	30.5
8	35394	Karaganda	49.8	73.1
9	31735	Khabarovsk	48.5	135.1
10		Rostov-on-Don	47.5	41.5
11	32150	Bol'shaya Yelan'	46.9	142.7
12	35746	Aral Sea	46.8	61.7
13	31960	Vladivostok	43.1	131.9
14	38457	Tashkent	41.3	69.3
15	38880	Ashkhabad	38.0	58.3

Table 21

List of the IQSY Atmospheric Electricity Stations of the USSR

No.	Index	Station	Lat. N	Long. E
1	26063	Leningrad	60.0	30.3
2	28440	Sverdlovsk	56.8	60.6
3	33345	Kiyev	50.4	30.5
4	32150	Bol'shaya Yelan'	46.9	142.7
5	33837	Odessa	46.5	30.6
6	38457	Tashkent	41.3	69.3

APPENDIX II

November 1962 Meeting of Presidium of the Academy of Sciences USSR

"At a presidium meeting of the USSR Academy of Sciences on 16 November Professor Nikolay Pushkov described the program of scientific observations to be carried out during the Year of the Quiet Sun and measures for the program's realization. The scientist pointed out that the great role to be played by earth satellites in Soviet research. He declared, specifically, that satellites are likely to carry out patrol observations of ultraviolet and x-ray radiations. The satellites will also measure electron concentration in the upper layer of the ionosphere.

In the course of the Year of the Quiet Sun, Soviet scientists are planning to send satellites into elliptical orbits to measure magnetic field and corpuscular radiation. Professor Pushkov reported that the scope of measurements conducted by rockets is to be expanded. All data telemetered from satellites and rockets will be supplemented by observations at ground, solar, magnetic, ionosphere, and other stations. The scientists have singled out a number of most important themes to be elaborated during the Year of the Quiet Sun, such as the problem of solar activity, cosmic rays, terrestrial magnetism, aurora borealis, and so forth. Professor Pushkov said that at present more than 40 countries are willing to participate in the Year of the Quiet Sun." (Radio Moscow, 238, 7 Dec 1962, CC 21-22)

"The Academy of Sciences USSR jointly with other administrations will carry out a complex of observations and investigations during the period of the International Year of the Quiet Sun (IQSY, 1964-1965).

The purpose of the observations in the IQSY program being planned in most countries in the world is to obtain planetary data which, when compared with data of the International Geophysical Year (IGY), which was conducted during the maximum solar activity, for the first time will give an idea of the characteristics of the changes of geophysical phenomena and processes in the course of the whole 11-year solar cycle.

In the period of the IQSY many new observations and investigations not made during the IGY will also be undertaken using the latest acquisitions of science and technology for explaining the mechanism of the effect of solar processes on the earth and on space around the earth. In addition, certain phenomena can be studied only during the period of minimum solar activity and when magneto-ionospheric disturbances are insignificant. On the whole, IQSY data are destined to play an important role in the solution of the fundamental problems of modern planetary geophysics and in practical problems in forecasting conditions for long-distance radio communications, forecasting phenomena in space around the earth, and problems associated with providing aviation and shipping with geophysical information, the improvement of magnetic maps, etc.

In order for the institutes of the Academy of Sciences to carry out successfully studies connected with the IQSY, and that they may make effective use of the results of these studies for the development of Soviet science, the Presidium of the Academy has engaged the Institute of Magnetism, Ionosphere, and Propagation of Radio Waves, the Institute of the Physics of the Earth, the Institute of the Physics of the Atmosphere, the Main Astronomical Observatory, the Crimean Astrophysical Observatory, and the All-Union Astronomical-Geodesical Society to complete in 1963 the necessary modernization of the equipment and provide the relevant stations, points, and observatories with observation and research instruments and apparatus which will ensure in 1964-65 a high level of scientific observation and investigation in accordance with the program of the IQSY.

The commissions for the investigation and utilization of outer space have been given the mission of preparing the Soviet program of investigation of cosmic space in the period of the IQSY for presentation to the international organizations.

The Department of Physics and Mathematics must inspect the state of studies in the USSR on the whole complex of electromagnetic phenomena in the upper atmosphere and studies in the physics of the atmosphere and make proposals concerning the basic problems of science in the given field, the reinforcement of the theoretical and experimental bases of these studies at the institutes, and the coordination of the investigations.

The following basic guidelines for scientific investigations during the period of the IQSY have been approved:

1) study of the development of processes on the sun and their effect on the earth, taking into account data on the whole cycle of solar activity and on the nature of the physical processes of the sun and the nature of their effect on the ionosphere and the magnetic field of the earth;

2) investigation of the structure of disturbances and variations in the magnetic field of the earth and their connection with solar corpuscular streams, with the level of activity of the wave radiation on the sun and disturbances in the ionosphere, taking into account conditions created by a low level of solar activity;

3) study of short-period fluctuations of telluric currents and of the magnetic field of the earth, of the correlation of these variations with various geophysical phenomena, the nature of the electromagnetic field of the earth, and also the spatial distribution of the field in the period of maximum and minimum solar activity;

4) investigation of the radiation belts of the earth in relation to changes in the level of solar activity;

5) investigation of the spectrum and composition of low-energy particle, solution of the problem of the 'bend' in cosmic rays, determination of the position of the equator of cosmic rays, explanation of the interaction between the magnetic dipole of the earth and the plasma surrounding it, study of the sidereal variations of cosmic radiation and of the electromagnetic conditions in space around the earth from variations of cosmic radiation at the maximum and minimum of solar activity;

6) study of the state of the ionosphere and of radio-wave propagation conditions, of the temporal and geographic variations of the electron concentration of the F layer, of the morphology and physics of the quiet ionosphere and of ionospheric disturbances, of ionospheric winds, of tidal movements, of the connection between the state of the ionosphere and changes in the level of x-radiation and ultraviolet radiation from the sun, of the absorption of radio waves during the maximum and minimum of solar activity;

7) the study of drift and of the physical properties of meteoric fragments, of the interaction of meteoric matter with the upper layers of the atmosphere, and of its effect on the state of the ionosphere and on the propagation of radio waves;

8) study of the effect of the level of solar activity on the atmosphere of the earth, investigation of the general circulation of the stratosphere on a worldwide scale and explanation of the mechanism of the effect of solar activity on this circulation, investigation of the connections between the radiation balance of the earth with processes of a planetary scale and the level of solar activity, and also the effect of solar radiation on stratospheric ozone and on noctilucent clouds." (Akademiya nauk SSSR. Vestnik, no. 2, 1963, 112-114)

APPENDIX III

Quartz Geomagnetic Elements

"The impending International Year of the Quiet Sun and the achievement of studies in the project for studying the upper mantle of the earth are increasing the importance of geomagnetic measurements even further. In order to carry out the program of these studies, it will be necessary to expand the network of geomagnetic observatories in constant operation, and also to organize temporary observations under field conditions at a great number of points. However, the development of these studies is being retarded by the lack of a sufficient quantity of equipment and instruments to ensure reliable measurement of geomagnetic variations at the observatories as well as in the field. The apparatus for magnetic observatories, which up to the present time has been obtained abroad, has substantial defects: the base values of the instruments, as well as the values of the multipliers, were highly unstable, and were dependent on ambient temperature and humidity. Because of the large period of natural oscillations of the support systems and the dependence of the multiplier on the deflection angle of the support system, these instruments were not very suitable for high-sensitivity installations. For this reason, under the conditions prevailing at the magnetic observatories it was possible to obtain reliable data on variations only by spending a great deal of time processing the observation materials. Because of the great need for instruments for use in magnetic observatories there is an urgent demand for the organization of the lot production of Soviet geomagnetic instruments capable of satisfying the growing demand for quantity as well as quality.

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A highly stable quartz sensing element with zero temperature coefficient (Fig. 1) has been developed as the result of experimental studies conducted for five years at the Institute of Geomagnetism, Ionosphere, and Propagation of Radio Waves of the Academy of Sciences USSR. This element makes possible the rapid solution of the problem of organizing the series production of various geomagnetic instruments. The quartz sensing element is made in the form of an all-quartz frame *1*, three sides of which are made of bar vitreosil; a thin quartz filament with attached supporting structure *2* consisting of a permanent magnet and a quartz mirror acts as the fourth side. Damper *3*, which ensures the rapid damping of oscillations of the supporting structure, is attached at the center on the quartz frame, as in quartz mirror *4*, which serves to control the proper installation of the supporting structure and of the recording of the base line. Magnets *5*, which compensate the direct field component of the component to be recorded, are attached to the side on the quartz frame.

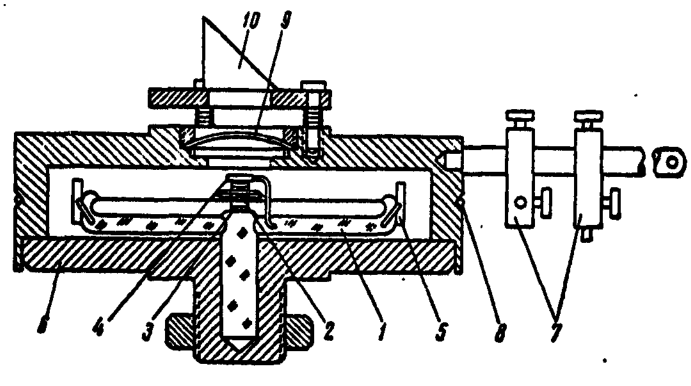

Fig. 1. Quartz sensing element

The sensing element is fixed in hermetically sealed housing *6*. On the side of the housing there is a bus along which the two carriers *7* move with additional magnets which serve for changing the multiplier, and also for tuning the sensing element to the corresponding field. Determination of the multiplier of the sensing elements is done with the aid of calibration ring *8*, which is wound directly on the side surface of the housing. Spherical lens *9* and prism *10* are set up on the top of the housing for optical control.

The quartz sensing elements have a number of very important properties. First of all, when properly adjusted, they can be used to record variations of any component of the earth's magnetic field. The readings of the sensing elements are distinguished by high stability of the base values of the multiplier and are not dependent on ambient temperature and moisture. Independence of the readings from temperature is achieved by using magnets with zero temperature coefficients. Since alignment of the sensing elements is done in a compensated magnetic field and with untwisted filaments, the multiplier practically does not reflect the angle of turn of the supporting structure.

Depending on their function, sensing elements can be made with supporting structures which have a different moment of inertia. In such systems magnets with moments of 0.1 to 10 CGS are used. The period of natural oscillations of a low-inertia system is less than 1 sec even when the multiplier is 0.05γ ($1\gamma = 10^{-5}$ oe) per minute of rotation.

A series of quartz magnetic variometers consisting of four independent instruments for recording variations of field strength T, the horizontal component H, the declination D, and the vertical component Z under conditions prevailing during magnetic observations have been developed at the Institute on the basis of the quartz sensing element.

Prolonged testing of the instruments at the Central Magnetic Observatory has confirmed their high quality. In two years of continuous operation, for example, quartz T- and Z- variometers maintained practically constant base values. Series production of quartz variometers for magnetic observatories has already begun. The quartz sensing element can also be used for developing the design of portable field variation stations.

Fig. 2 shows the setup of a single-component magnetic variation station for recording variations of the vertical component Z under field conditions. The variation station consists of an opaque box inside of which are fixed a housing with a sensing element, a light source lamp, a cylindrical lens, and two additional mirrors ensuring the optical level inside the station at 100 cm. A detachable recording device with a time mechanism is set up on the front wall of the station. On the back wall there is a bus along which two carriages move with magnets for changing the multiplier and for tuning the station in the region where it is going to operate. An auxiliary compensating magnet is fixed to a rotating bar inside the station for broadening the range of operation. All the magnets used in the station have practically zero temperature coefficients, which ensures independence of the variation station readings from temperature. The overall weight of the station together with the recording device does not exceed 5 kg. The station described can be taken as a basis for working out the design and construction of all types of variation stations. The Institute has developed and prepared single-component stations for recording variations of T, Z, H, and D, and a three-component variation station for the simultaneous recording of variations of D, H, and Z under field conditions. The overall weight of the three-component station with the recording device is 10 kg. All the stations make it possible to record variations with the multiplier of up to 1 γ per mm.

Fig. 2. Single-component magnetic variation station

The use of low-inertia sensing elements in existing microvariation stations makes it possible to broaden the range of variation recordings to 5 cps with a multiplier up to 0.001 γ per mm. In addition, magnetometers for the relative measurement of the Z- and H- components, instruments for the measurement of the magnetic properties of rock, and also other geomagnetic components can be designed and built on the basis of these sensing elements." (Bobrov, V. N. IN: Akademiya nauk SSSR. Vestnik, no. 2, 1963, 82-84)

New Institute for Cosmophysical Study and Aeronomy

"The Presidium has decided to organize an Institute for Cosmophysical Study and Aeronomy in Yakutsk at the Siberian Department of the Academy of Sciences USSR. The Institute will incorporate the Laboratory of Physical Problems and some nonorganic sections of the Geophysical Observatory of the Filial.

The basic lines of the scientific activities of this Institute have been decided. They include the study of variations of cosmic rays, wide atmospheric showers, stratospheric, extra- atmospheric, and ionospheric studies, polar auroras, geomagnetism and earth tides, and the physics of the atmosphere.

Seven laboratories and a theoretical research section with a computation center are foreseen for the Institute. The 'Tiksi' polar laboratory for complex geophysical study, the "Zhigansk" laboratory for magneto-ionospheric research, and a station for observing artificial Earth satellites are included in the plans." (Akademiya nauk SSSR. Vestnik, no. 11, 1962, 127-128)

New Grating Spectrographs for Solar Telescopes

"A series of powerful grating spectrographs of new design developed for solar investigations has been built by the State Optical Mechanical Plant. These spectrographs, used in conjunction with solar telescopes produced during the past

year for the Soviet Solar Service, are already being used at various observatories. Preparations for the International Year of the Quiet Sun have now begun. The new instruments are therefore being rushed to observatories. They will make it possible to expand considerably the program of solar studies and geophysical prediction and make complete and around-the-clock studies of the sun. The optical systems of the instruments make possible highly precise analyses of the solar spectrum. The new spectrographs have an original type of heat insulation. This allows them to be compact and easily controlled, while producing an image which is close in quality to the vacuum spectrograph, which has unwieldy auxiliary apparatus. The new spectrographs are designed for obtaining photographs of the solar spectrum... The new apparatus operates with solar telescopes of any type." (Kommunist [Yerevan], 6 Jan 1963, 1).

TASHKENT IONOSPHERE STATION

"An ionospheric station has been opened near Tashkent. The station's staff will take part in observations under the program of the International Year of the Quiet Sun. By means of radio probes to an altitude of 350 kilometers, scientists will continually observe the state of the ionosphere and its interaction with the sun.

They plan to study the structure of upper atmospheric layers and variations in their temperature, pressure, and wind directions, as well as the disturbances caused by the sun. In addition to solving theoretical problems, the observations will be of use for weather forecasting and radio communications." (Radio Moscow, 46, 7 Mar 1963, CC 5)

TASHKENT ASTRONOMICAL OBSERVATORY

"This year the Tashkent Astronomical Observatory will celebrate its 90th anniversary. A 'Pravda vostoka' correspondent approached Professor V. P. Shcheglov, Director of the Observatory, and asked him to discuss the present work of the astronomers of the Republic. The following is Shcheglov's reply:

> 'Our observatory is the oldest scientific institution in what used to be known as Turkestan. The first astronomical observations were recorded here on 11 September 1873, when the geographical coordinates of Tashkent were determined. Work on the construction of buildings began the following year.

The number of scientific problems and the amount of research work increased tremendously after the Revolution. These problems have taken on an entirely different shape, especially in these days when we are faced with the problem of conquering space.

The Observatory required new and more sophisticated equipment which could not be accommodated in the existing buildings. A new laboratory building is now being built in the Observatory park. It will house the laboratories for solar physics, meridian studies, photographic astronometry, the observation of artificial satellites, and the study of variable stars. The old time laboratory, started during the first years of the revolution, will remain in the old building, but will be given much more space than it presently occupies.

The new building will also accommodate the new library, which will be one of the best astronomy libraries in the country. In addition to provisions for storing books, the library will also have a reading room and other accommodations. This will make it possible to make wide use of the rich collection of books for scientific purposes. I can mention that the library will have such rarities as 'The Fundamentals of Astronomy' by the well-known Polish astronomer and scientist of the 17th century, J. Hevelius. This book is unique in the literature in that it has a picture of the famous astronomer Ulugh Beg, sitting among other astronomers of the world. The expansion of our laboratories now is of especially great importance. since our Observatory is making preparations for the international undertaking known among specialists as the 'Year of the Quiet Sun.' The IQSY will extend from July 1 1964 to December 31 1965. The very name 'Quiet Sun' derives from the activity of the sun reflected in the processes observed on its surface, which change every 11 years. The studies of the International Geophysical Year were timed with the maximum of activity. The Year of the Quiet Sun will encompass the period of minimum activity, when it is easiest to observe the actual connection between soiar activity and the individual phenomena occurring on the earth. Particular attention will be given to disturbances in radio communications and to the observation of auroras and cascades. During powerful solar explosions short-wave broadcasting is practically cut off in the entire part of the earth's hemisphere illuminated by the sun. However, to the joy of short-wave radio amateurs, we can add that the conditions for work in the year of the Quiet Sun will be most favorable. Recently, it was found that solar activity influences the changes of the radio belts surrounding the earth. The study of these belts is of primary importance for manned space flights.

In addition to taking an active part in solar observations, the Tashkent Observatory will also conduct methodical observations of rapid processes in the solar atmosphere. In connection with this work, the existing scientific equipment will be supplemented with a large telescope which, in combination with a modern spectrograph, will make it possible to measure the magnetic fields of sunspots. I wish to stress that our observatory has had broad experience in the field of solar observations. During the IGY the decision was made to make a motion picture of the activity of the sun. The pictures were taken by astronomical stations on various continents and countries. This picture contains films taken by the Tashkent Observatory.

Our excellent work record commits us to a great deal. For this reason, the Observatory is making preparations for carrying out future research in accordance with the program of the International Year of the Quiet Sun." (Pravda vostoka, 17 Feb 1963, 4)

Interview With Pushkov

The delegation of Soviet scientists which attended a session of the International Committee on Geophysics in Rome has just returned. We print below an interview granted our correspondent by one of the delegates, Nikolay Pushkov, Vice-Chairman of the Soviet Geophysics Committee, and a Lenin Prize winner.

Question: 'What problems were discussed at the Rome session?'

Answer: 'The results of the International Geophysical Year (IGY) were summed up, national research programs coordinated, and a more exact general plan agreed upon for the IQSY to embrace our whole planet. The geophysicists discussed how best to organize simultaneous exploration in the Arctic and Antarctic regions. All of us also thoroughly examined the proposal for setting up world analytical centers. Decades were spent processing certain results of the Second International Polar Year (1932-1933), whereas world analytical centers with up-to-date computer techniques can process initial data as it comes in. Several dozen such centers will be established.'

Question: 'What have the Soviet scientists included in their observation program?'

Answer: 'We intend to conduct extensive research of solar activity, terrestrial magnetism, the ionosphere, cosmic rays, aurora borealis, night sky glow, upper layers of the atmosphere, and cosmic regions.

Observations conducted over many years show that solar activity reaches its climax every 11 years on an average, but these peaks are far from being the same in intensity. The greatest known peak was in 1957-1958, the period chosen by the scientists for integrated study and named the International Geophysical Year.

The wealth of material gained by the joint effort of scientists of different countries is still being processed, but the initial, fundamental findings have expanded our knowledge of the earth and the phenomena taking place on it in connection with solar activity. Scientists are equally interested in learning more about the influence of a quiet sun -- a period when the number of sun spots and chromosphere eruptions grow less and at times disappear altogether. This is why it has been decided to conduct extensive observations in such a period, starting on 1 Jan 1964 and ending on 31 Dec 1965.

As I have said, our knowledge has been improved, but many scientific problems remain unsolved at this moment. For instance, the lower layer of the atmosphere (rarefied ionized gas at 80 km and higher) has been poorly studied so far, while the upper layer (up to 1000 km above the surface of the earth) also conceals many mysteries. A great deal still remains unknown of cosmic rays and the ultraviolet and X-radiation of the sun as well as of other spheres of solar activity. In this connection, the range of observations in these sections of the program is being considerably widened.

Observations will be made of the influence of solar activity on comets. Near-solar regions, at tremendous distances from the earth, will be included in the research areas. Great attention will be given to the study of the earth's radiation belts, especially the outer belt, which is most dependent on solar activity. What takes place here is most important, particularly for astronauts.

Ground stations and our nonmagnetic ship, the Zarya, unique in the world, will continue studying the features of geomagnetism. Radiosondes and meteorological and geophysical rockets will be used in exploring the upper layers of the atmosphere.'

Question: 'Who will take part in the IQSY program?'

Answer: 'As far as I know, 63 countries have served notice of their attention to participate. Cuba and the new African states are included. In conclusion, I would like to point out that the IGY blazed the way to wide cooperation among the scientists of different countries. Joint work on the IQSY program will undoubtedly further strengthen the cooperation of all geophysicists of the world in gaining knowledge of the universe." (Sovetskaya Rossiya, 11 Apr 1963, 4)